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entine 96°, Huron, Dak., 94°, Bismarck 90°, Fort Sully 98°, Rapid City 92°, and Fort Custer 90°. An area of lower barometer has developed in the mountain regions of Idaho, Montana, and Wyoming, or has advanced from the west and is now central in that region, drawing the wind from the south across Kansas and Nebraska at from 16 to 24 miles per hour. During this afternoon occurred some *hot winds* in the western counties of our State. In Morton, Stevens, Grant and Stanton the temperature reached 99°, in Trego and Gove 100°, and in Thomas 102°. At North Platte, Neb., it reached 102°, and at Valentine 106°.

On the morning of July 6th this area of low pressure has moved southeastward, and is now central in the northwestern part of Nebraska and southwestern part of Dakota. This being Saturday, no afternoon map was issued. The 7th being Sunday, no morning map was issued, but the afternoon map shows the low pressure divided, a part being central in northwestern Iowa, and the other over the Panhandle of Texas, while the general current of the wind over Kansas is from the southeast. The maximum temperatures of this day were lower in Nebraska than in Kansas. At Dodge City it was 94°, at Gibson 105°, at Lisbon (Gove county) 100°, at Offerle (Edwards county) 98°, at Englewood 97°, at Hugoton 97°, and at Colby 98°. The general current of the wind over Kansas was changed to east and northeast, responding to an area of low pressure over the Panhandle and New Mexico.

The rain of the 8th, and the high pressure following, materially lowered the temperature for the next few days.

An extensive area of low pressure in the mountain regions on and after the morning of the 12th, kept our winds southerly until the night of the 17th–18th, the maximum temperatures of the 17th, being the maximum for this hot wave, were as follows: North Platte 100°, Colby, Kansas, 103°, Lisbon 108°, Gibson 114°, Dodge City 100°, Offerle 103°, Hugoton 100°, Englewood 101.5°, Fort Elliott, in the Panhandle, 102°, Fort Sill, Indian Territory, 96°, and El Paso, Texas, 100°.

But as this paper is only preliminary to a fuller discussion of this subject at our next annual meeting, its object at this time being to show the line and method of research, its purpose is deemed fulfilled.

## SOME TESTS OF CEMENTS MANUFACTURED IN KANSAS.

BY E. C. MURPHY, STATE UNIVERSITY, LAWRENCE.

The tests which form the basis of this paper were made by the writer at the State University during the month of July, 1889.

It was the writer's intention to test all the cements manufactured in Kansas. Cement is reported as having been manufactured at Fort Scott, Kansas City, Manhattan, Alma, and Topeka. Only those manufactured at Fort Scott and Kansas City could be found in the market at this time, and hence they are the only ones tested.

In order to get the relative value of these two cements, and their value compared with a standard cement, I have tested with them, under the same conditions, a German Portland cement.

Much care has been taken to have the conditions under which the tests were made, the same for each cement. To this end the following method of testing was used: The water used in mixing the cement, as well as that in which the specimens were placed, was left in the testing-room (one of the large rooms of the main University building) for 24 hours before using, in order to have a uniform temperature. A bricket of each cement was then mixed to as nearly as possible the same degree of plasticity; the mold in which the bricket was made was filled, placed on a marble slab and left until the cement was stiff enough to be taken out of it; after 24 hours in air the brickets were placed in the water box and left until broken; they were broken immediately after being removed from the water.

The Kansas City and Fort Scott cements were purchased from a cement dealer in Kansas City. The Portland is an imported cement purchased from Grovenor & Son, Lawrence, Kansas.

One hundred and fifteen specimens were made, one hundred and five of which were broken, and go to make up the estimates. They were broken in an Olsen cement-testing machine of 2,000 pounds capacity.

The sand used in making some of the brickets is Kaw river sand. It was sifted through sand sieve No. 20, 400 meshes (Stubb's No. 28 wire) to the square inch. The portion which passed through the sieve was used.

The fineness was tested by weighing one pound of the cement, sifting it through cement sieve No. 50, 2,500 meshes (Stubb's No. 35 wire) to the square inch, and weighing the portion which did not pass through the sieve. The ratio of the weight of the portion which did not pass through the sieve to one pound, reduced to per cent., gave the fineness.

Table I gives the percentage of each cement which did not pass through cement sieve No. 50.

TABLE I.

| NAME. | PER CENT. |
|---|---|
| K. C...... | 27.3 |
| F. S...... | 23.5 |
| P.......... | 7.8 |

The specimens used in the tensile tests were of the standard size and shape. Their smallest section has an area of one square inch.

Table II gives the name, age, number of specimens of each kind broken, and the breaking load of neat cement.

TABLE II.

| NAME. | AGE. | NO. SPECS. | BR. LOAD. |
|---|---|---|---|
| K. C......... | 1 day........ | 3............. | 7 |
| F. S......... | " ........ | 3............. | 25 |
| P ............ | " ........ | 3............. | 75 |
| K. C......... | 7 days...... | 6............. | 17 |
| F. S......... | " ...... | 6............. | 32 |
| P ............ | " ..... | 6............. | 174 |
| K. C......... | 14 days..... | 4............. | 34 |
| F. S......... | " ..... | 4............. | 66 |
| P ............ | " ..... | 4............. | 237 |
| K. C......... | 21 days..... | 4............. | 39 |
| F. S......... | " ..... | 4............. | 87 |
| P ............ | " ..... | 4............. | 282 |

Table III gives the name, age, number of specimens of each kind broken, ratio of sand to cement, and the breaking load of section.

TABLE III.

| NAME. | AGE. | NO. SPECS. | RATIO. s. c. | BR. LOAD. |
|---|---|---|---|---|
| K. C. | 7 days | 3 | 1:1 | 6 |
| F. S. | ‘‘ | 3 | 1:1 | 7 |
| P | ‘‘ | 3 | 1:1 | 107 |
| K. C. | ‘‘ | 6 | 2:1 | 1 |
| F. S. | ‘‘ | 6 | 2:1 | 4 |
| P | ‘‘ | 6 | 2:1 | 49 |

The specimens used to test the transverse strength were rectangular prisms 14″x1½″x1″. They were broken on supports 12″ apart, by a weight in the center.

Table IV gives the name, age, number of specimens of each kind broken, and the breaking load of the above-described prisms of neat cement.

TABLE IV.

| NAME. | AGE. | NO. SPECS. | BR. LOAD. |
|---|---|---|---|
| K. C. | 21 days | 2 | 4 |
| F. S. | 21 days | 1 | 15 |
| P. | 21 days | 1 | 49 |

The specimens used in compression tests were sawed and ground from the broken rectangular prisms. Table V gives the results for these tests.

TABLE V.

| NAME. | AGE. | NO. SPECS. | BR. LOAD. |
|---|---|---|---|
| K. C. | 23 days | 6 | 230 |
| F. S. | 23 days | 6 | 829 |
| P. | 23 days | 6 | 1,908 |

No attempt has been made to measure accurately the hydraulic energy or quickness of setting of these cements, for lack of suitable apparatus. I may state, however, that the time required for the Kansas City and Fort Scott cements to harden sufficiently to be taken out of the mold without breaking, was from two to three hours. The Portland required from four to five hours.

The Fort Scott cement is being manufactured by two companies. The old works are operated by the Missouri, Kansas & Texas Cement Company; the new works are operated by the Fort Scott Cement Manufacturing Company. The latter company has six perpetual kilns, one Blake crusher, and a pea mill to aid the crusher. The capacity of the works is 500 barrels per ten hours.

The Kansas City Cement Works Company was incorporated December 6, 1884, and has been in successful operation for four years. This company has about eight perpetual kilns. It has been found necessary, in order to make the cement satisfactory, to bring rock from Milford, Kansas, and mix with the rock obtained near the works. Very little has been manufactured at these works during this year.

The cost per barrel at Lawrence of the three cements tested is: Kansas City, $1.65; Fort Scott, $1.65; and Portland $4.50.

## NOTE ON THE OVIPOSITION OF A WOOD-BORER.

BY PROF. E. A. POPENOE, STATE AGRICULTURAL COLLEGE, MANHATTAN.

The beautiful beetle known to the entomologist as *Tragidion fulvipenne* is not common enough to have received a vernacular name, and at no time have we had a surplus stock of specimens in our collections. Being on the watch for facts in its life history, I observed with interest that in the warm days about the end of September, my wood-pile was the center of attraction to a number of these beetles. Noting that all the individuals were females, and that, though at first seen only flying, they presently alighted with evidence of an earnest purpose, I watched them more attentively. They seemed to be attracted specially to the smooth sticks of round wood, of a species of oak, without much doubt the chestnut oak, as this is the only smooth-barked oak abundant in the vicinity of Manhattan. Over these sticks they crawled, paying little regard to my presence, their bodies close to the wood, their sensitive antennæ carried forward and constantly vibrating, as they investigated apparently every inch of the surface. The evident object of their search was suitable spaces for the deposit of their eggs, and though I watched with some care during my noon-hour for several days, I did not succeed in observing the beginning act in oviposition. I was fortunate enough to see two females that had not completed their work, however, and so was able to discover the eggs, which I might otherwise have failed to find at all. When detected in oviposition, the females were standing on the smooth bark, transversely to the stick, their bodies close to the surface, their antennæ bent under at the tips, which were touching the bark, and the broad tip of the abdomen closely appressed to the surface over which the insect stood. The close contact of the motionless tip of the abdomen to the bark, prevented my noting the exact mode of placing the egg, and presently, becoming somewhat impatient, I lifted a beetle from position; and, to my surprise, instead of an opening in the bark as I had anticipated, I saw a tubercle simulating so closely in appearance and color the corky outgrowths common on the bark of the chestnut oak, that I was at first inclined to believe it one of these, and to question the purpose of the female in maintaining so long the position described. On an examination of this tubercle, however, I found it to be hollow, and within it, lying on the bark, with no puncture or abrasion in the latter to be seen, was an oblong egg of a translucent, dull white surface, smooth and without markings so far as I could see with a pocket-triplet of good definition. This egg was sufficient in size nearly to fill the hollow tubercle, or egg-case, as I may now call it. The egg-case is rather regular, elliptical, strongly convex, measuring about one-sixteenth of an inch in length. Under the microscope the case appears on the surface to be made up of scales of the thin external layer of the oak bark, intermingled with glistening particles, as of dried mucus. The case is at this date unchanged, and no sign of the hatching of the egg is yet visible. I have been unable to find the record of similar habits in oviposition in any of the *Cerambycidæ*. Commonly the eggs are either laid under scales or in cracks in the bark, as with most of the wood-borers, or in a rough fissure